

# MRSA

What's new

Dr Ian Bowler

# MRSA

- Background
- Politics
- Philosophy
- Economics

# Background

- Staphylococcus aureus
- Methicillin=Flucloxacillin

Flucloxacillin sensitive

**MSSA**

Flucloxacillin resistant

**MRSA**

- Impact
  - Staphylococcus aureus
  - Methicillin resistance

# Impact of Staph aureus

GP

Respiratory

UTI

Skin\*

Gastroenteritis

Hospital

UTI

Wound\*

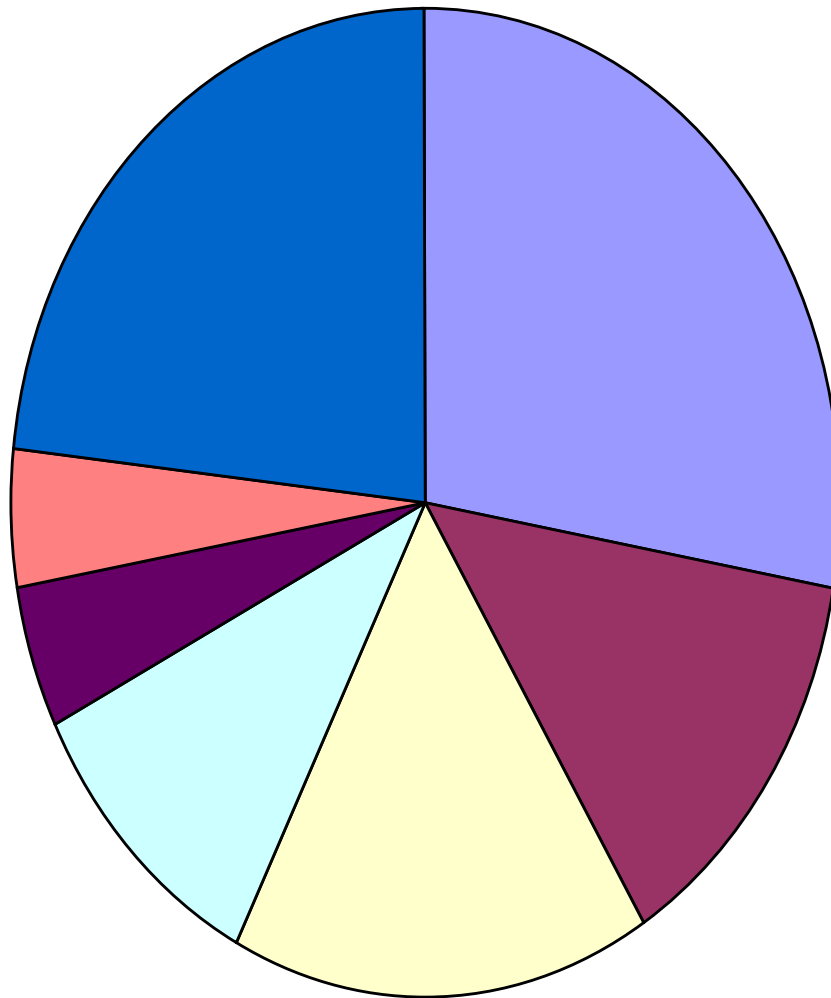
Respiratory\*

IV related bacteraemia\*

C difficile

Staph aureus: 20 % of hospital acquired infection

## ORH All Bacteraemia



- St aureus
- Enterococci
- E coli
- Streptococci
- Pseudomonas
- Candida
- Other

# Impact of antibiotic resistance

# MSSA

- $\beta$  lactamase                      penicillin

# MRSA

- Altered target
  - flucloxacillin
  - cephalosporins
  - meropenem, tazocin

- MRSA usually resistant to
  - ciprofloxacin
  - erythromycin
- Usually active
  - gentamicin
  - tetracycline
  - fucidic acid/rifampicin
- Always active
  - Vancomycin

# MRSA: special features

- Spread in hospital
  - sick patients
    - are touched - hands
    - invasive disease common
  - high antibiotic use



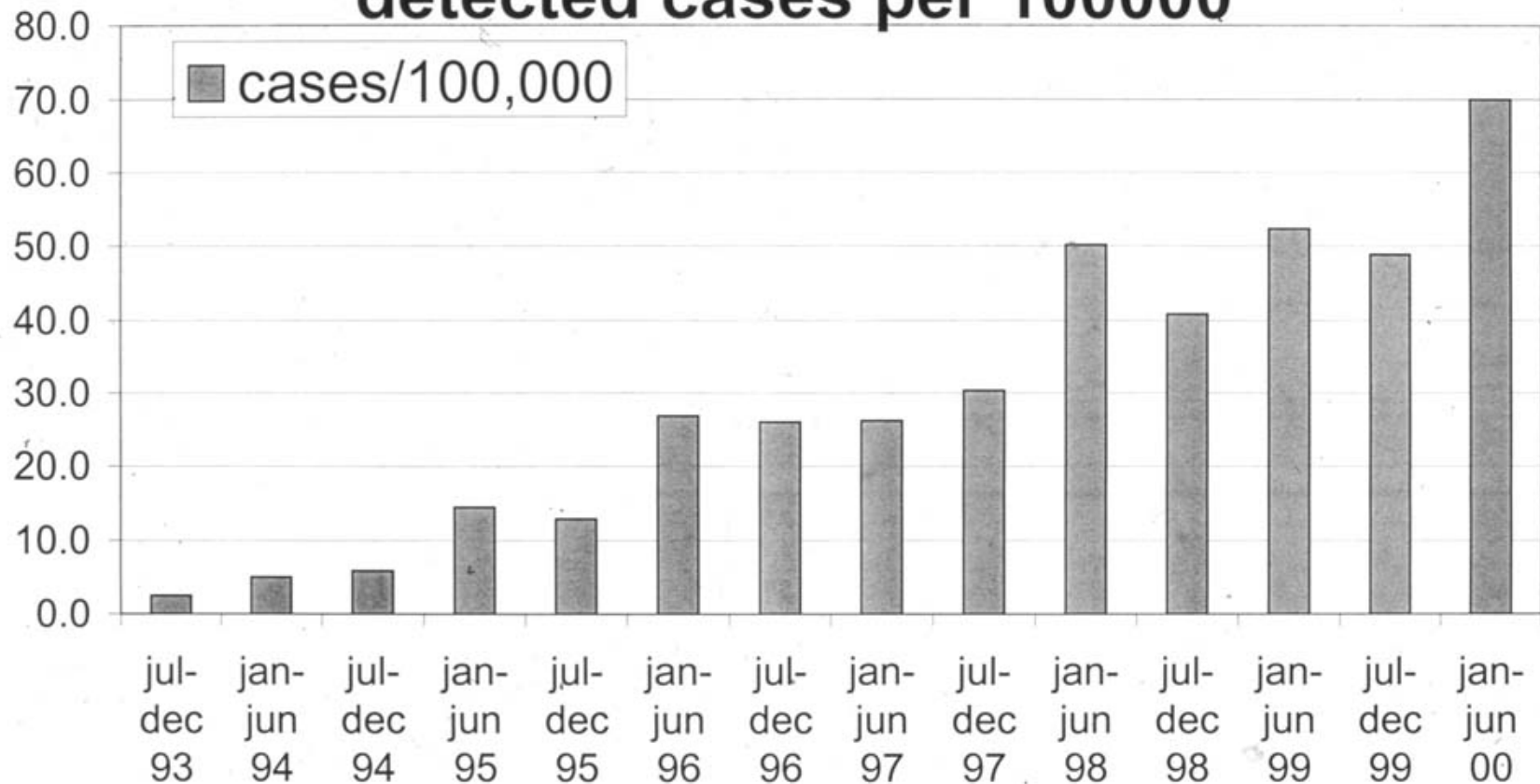
# MRSA: special features

- Little community acquired disease
  - transmission uncommon
  - attack rate low

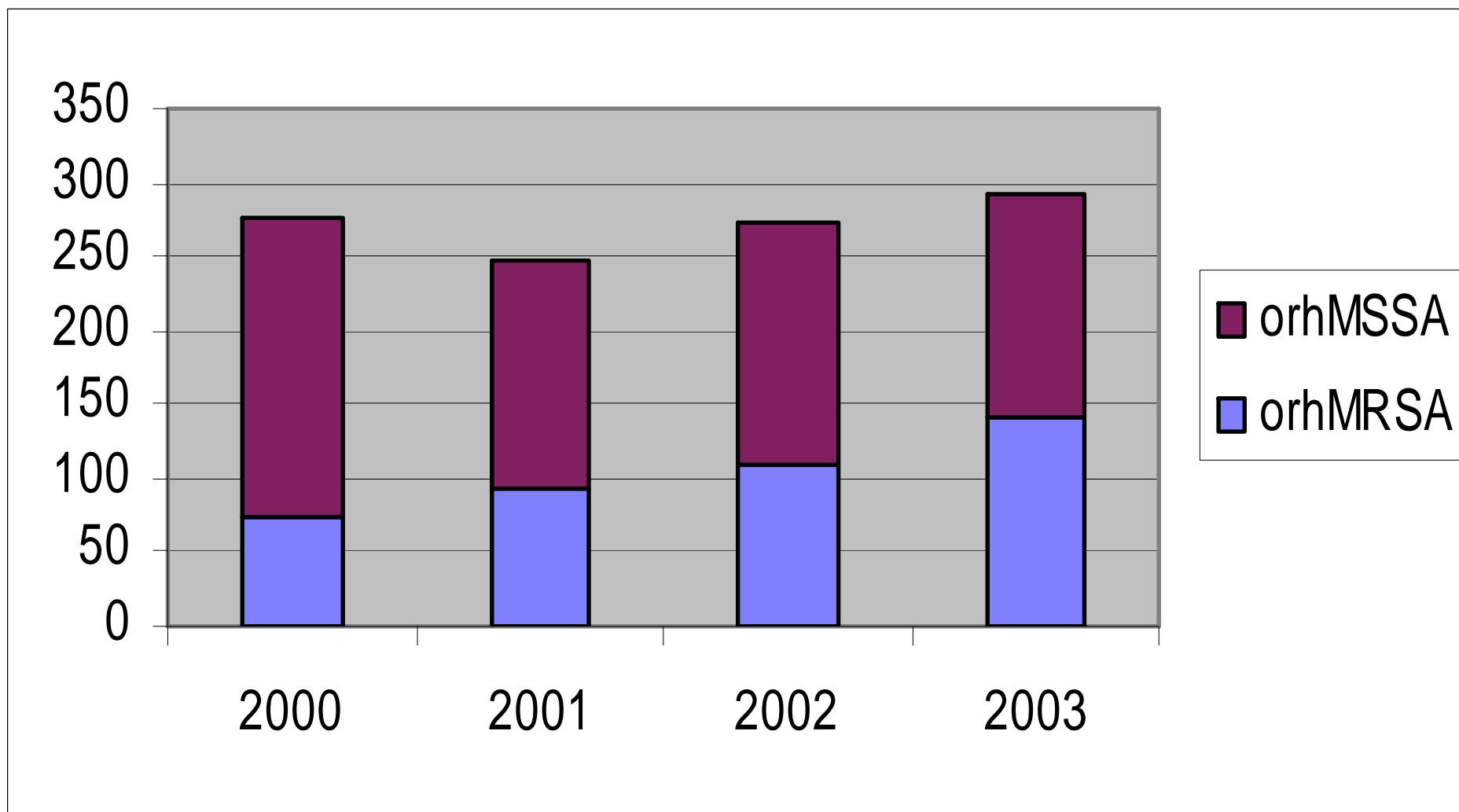
Contact with hospitals

- Impact on antibiotic use/cost in hospitals

## MRSA in Oxon residents, newly detected cases per 100000



# Staph aureus bacteraemia



- Prophylaxis

- Wound

Cefuroxime

Flucloxacillin/Gentamicin

- Treatment

- Respiratory

Amoxy/Cefurox/Mero/Tazo

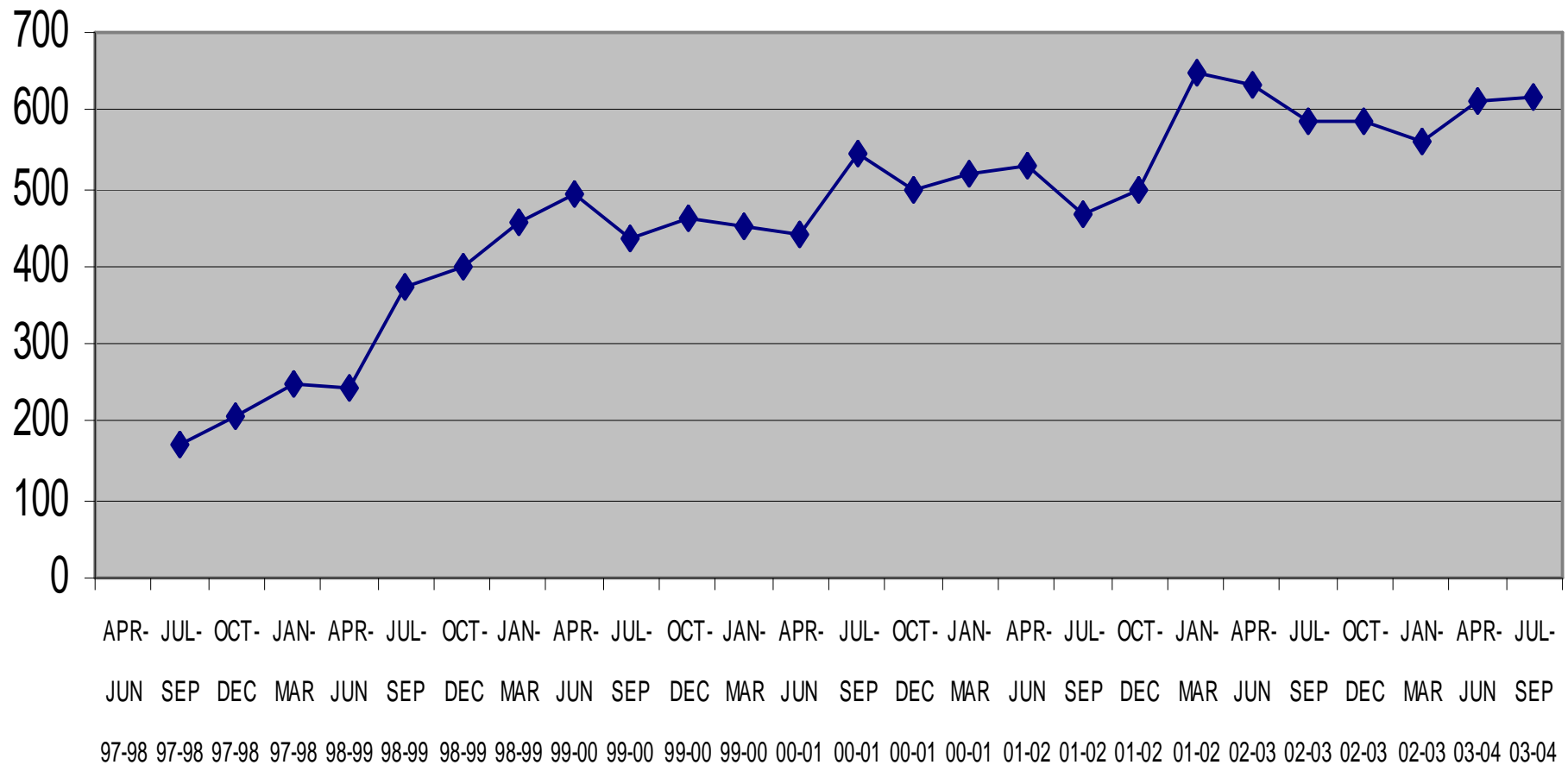
- Wound

Fluclox/Cefuroxime

- Sepsis

Cefuroxime/Mero/Tazo

## Vancomycin Use: 1g vials



# Impact on antibiotic use/cost

- Financial cost

- MSSA bacteraemia                      £ 6k

- MRSA bacteraemia                      £ 12k

- Ecological cost

# Cost of Staph aureus bacteraemia 2000-4

|        |          |               |
|--------|----------|---------------|
| • 1328 | Episodes | £11.1 million |
|--------|----------|---------------|

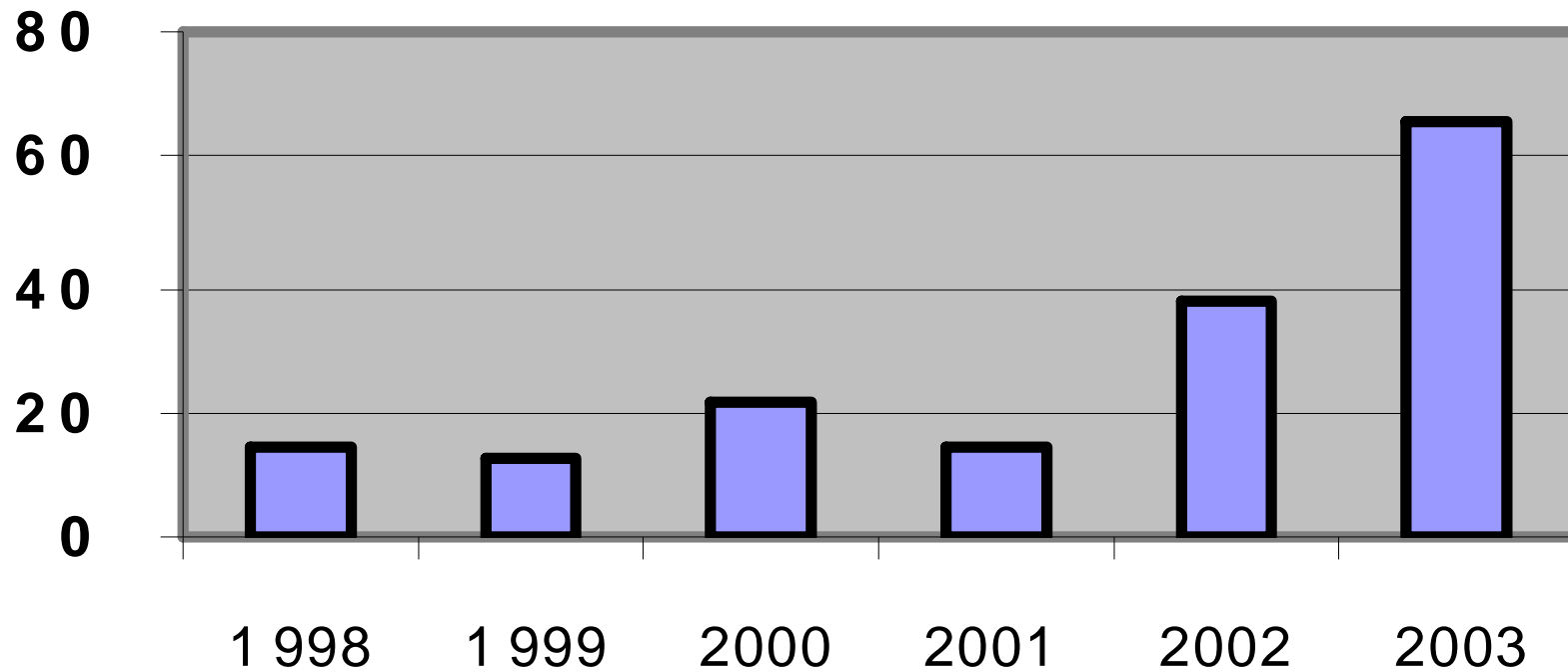
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|       |      |              |
|-------|------|--------------|
| • 528 | MRSA | £6.3 million |
|-------|------|--------------|

|       |      |              |
|-------|------|--------------|
| • 800 | MSSA | £4.8 million |
|-------|------|--------------|

Excess cost due to MRSA £3.1 million

## Patients with Vancomycin Resistant Enterococci





# Background - summary

- Staph aureus - important cause of HAI
- MRSA spreads in hospital
  - increasing costs
  - creating niches for more difficult organisms
- Impact in the community is limited

# Politics

# HOSPITAL SUPERBUG KILLS BABY

A NINE-DAY-OLD baby  
has died from the super-

**EXCLUSIVE**

all their questions. The couple also  
want NHS staff to be given clearer  
guidance on how to fight the deadly

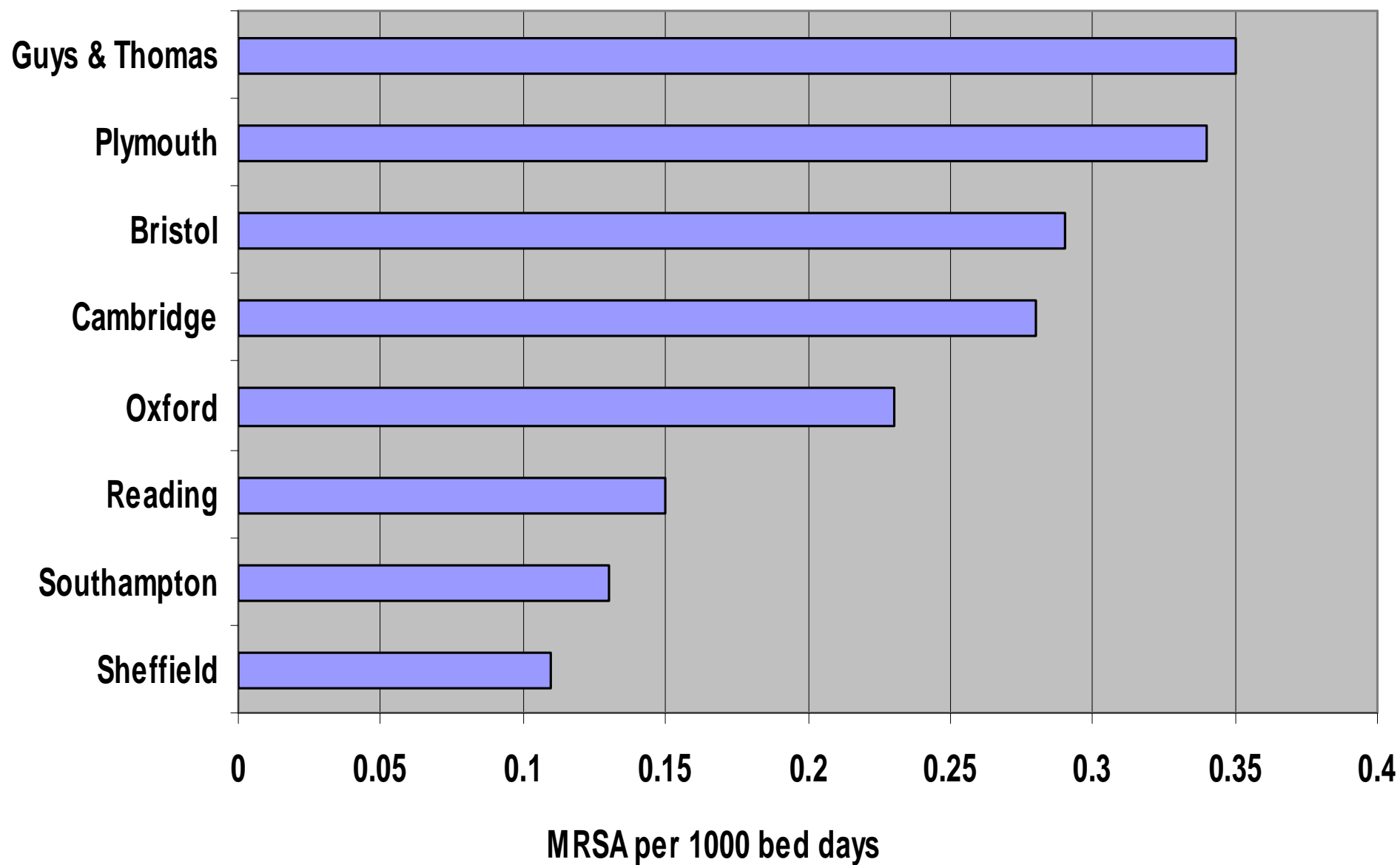
# Politics

- Target - MRSA bacteraemia in acute Trusts
- 60% reduction by 2008
- Performance monitored by TVHA
- Feeds into 'Star Rating'

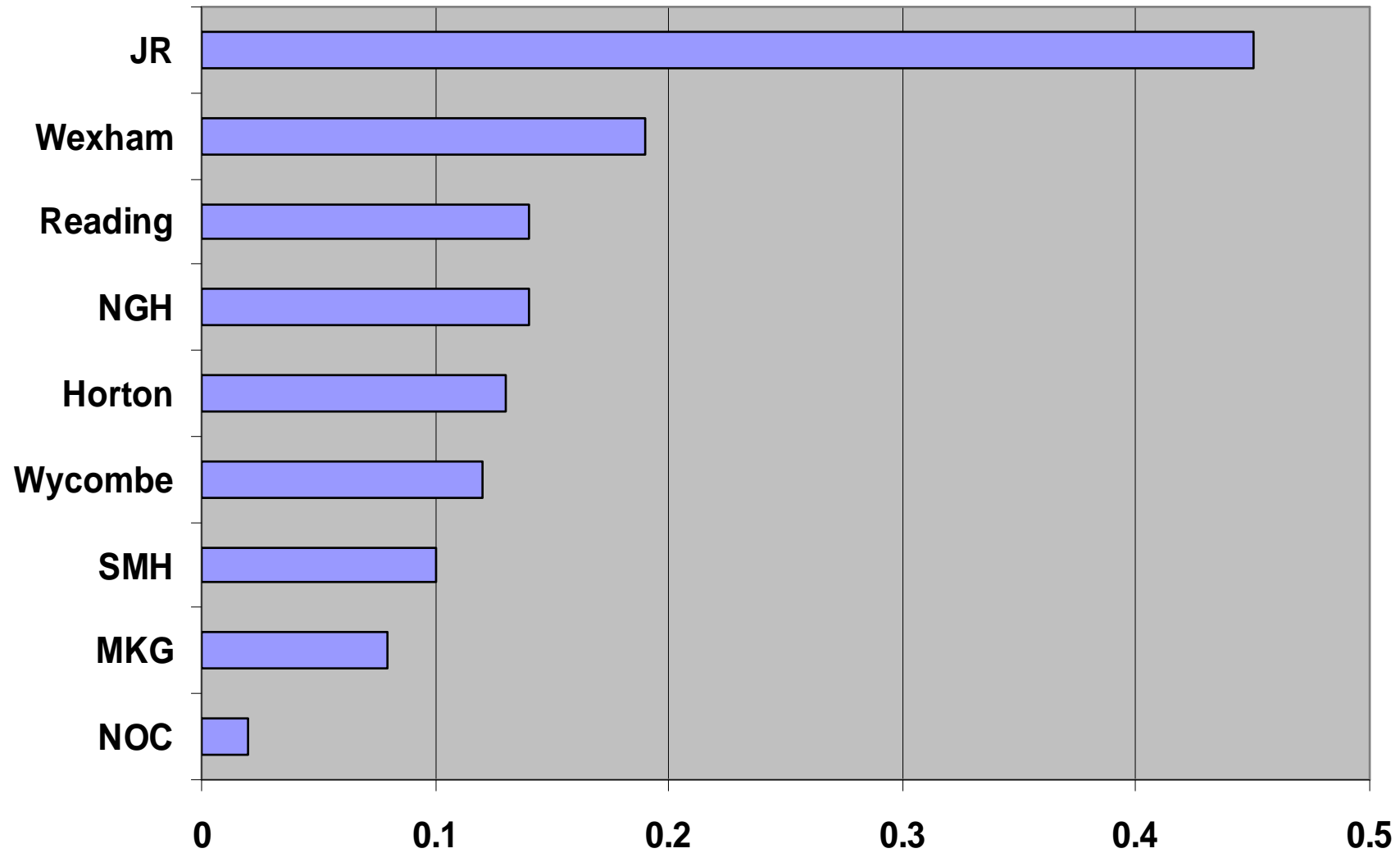
# MRSA bacteraemia: a quality indicator?

- Nearly all hospital acquired
- A measure of cross infection
- Expensive
- Inconvenient for patient
- Public concern

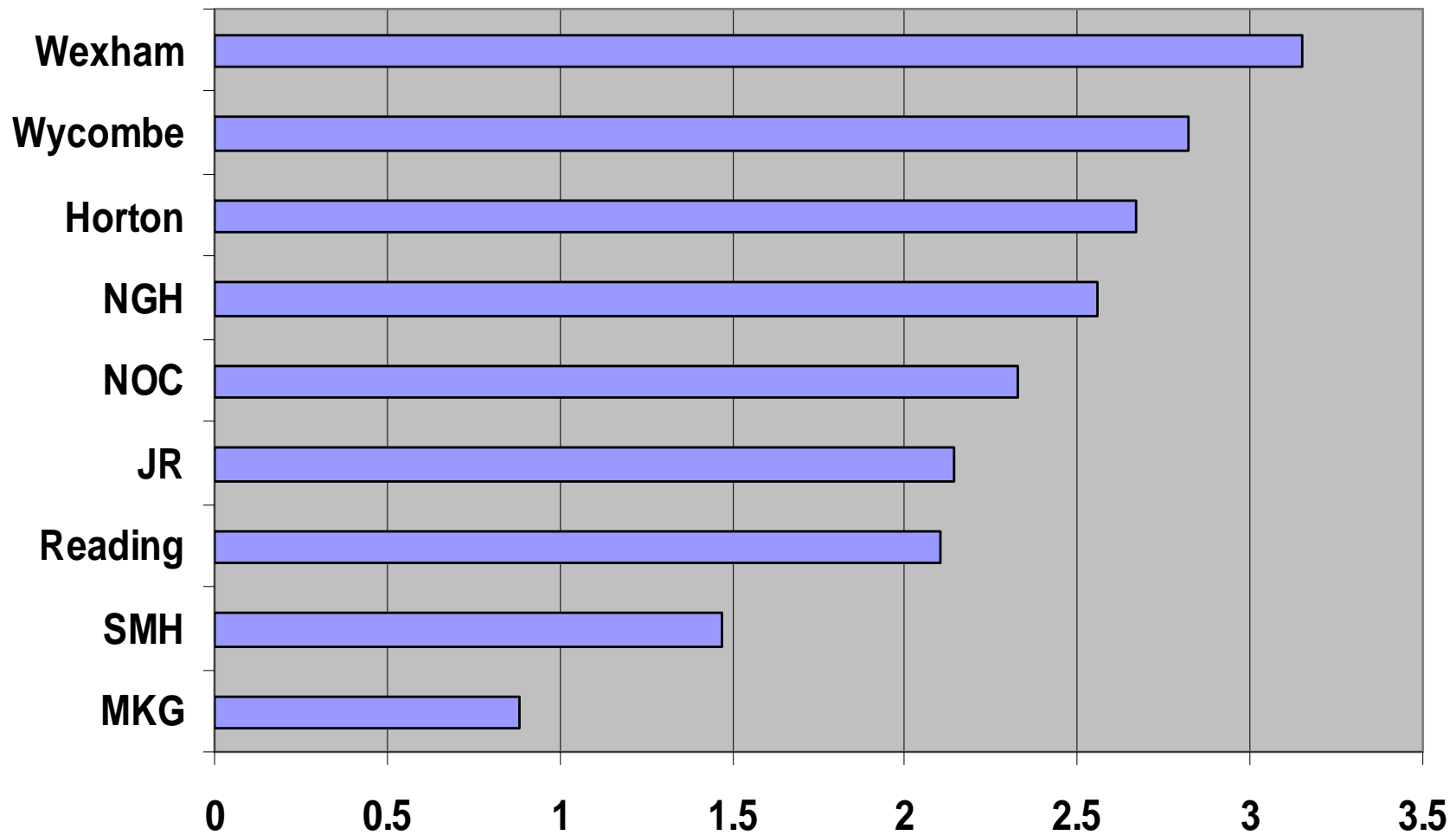
## MRSA bacteraemia rate: April - Sept 2001



## MRSA bacteraemia per 1000 bed days



## MRSA bacteraemia % positive blood culture





# Philosophy

- Organism
  - genome sequence - Hiramatsu - Japan
  - evolution of mecA - Enright - Oxford
- Virulence factors vary
- mecA inserts at low frequency
  - PV toxin positive strains in France and USA
  - EMRSA 15 & 16 in UK successful clones

# Philosophy

- Why MRSA might appear more virulent
  - Colonises poor host - high attack rates
  - Empirical antibiotics inappropriate
  - Appropriate antibiotics may not be so good

# Philosophy

- Host parasite interactions
  - Dutch Staph aureus study
  - Staph carriers at greater risk of infection
  - Non carriers who become colonised are at even greater risk
  - Is it bad to get a new strain of Staph aureus in hospital

# Economics

- Is control feasible?
  - Incidence of colonisation and infection can be reduced
    - Endemic
    - High risk units
    - Hospital wide

# Economics

- Can we afford it?
  - 3 Cost benefit studies
    - Endemic
    - Acute care settings
    - USA and Europe

# Economics

- Prevent acquisition
- Prevent invasion
- Staph aureus
- MRSA specific

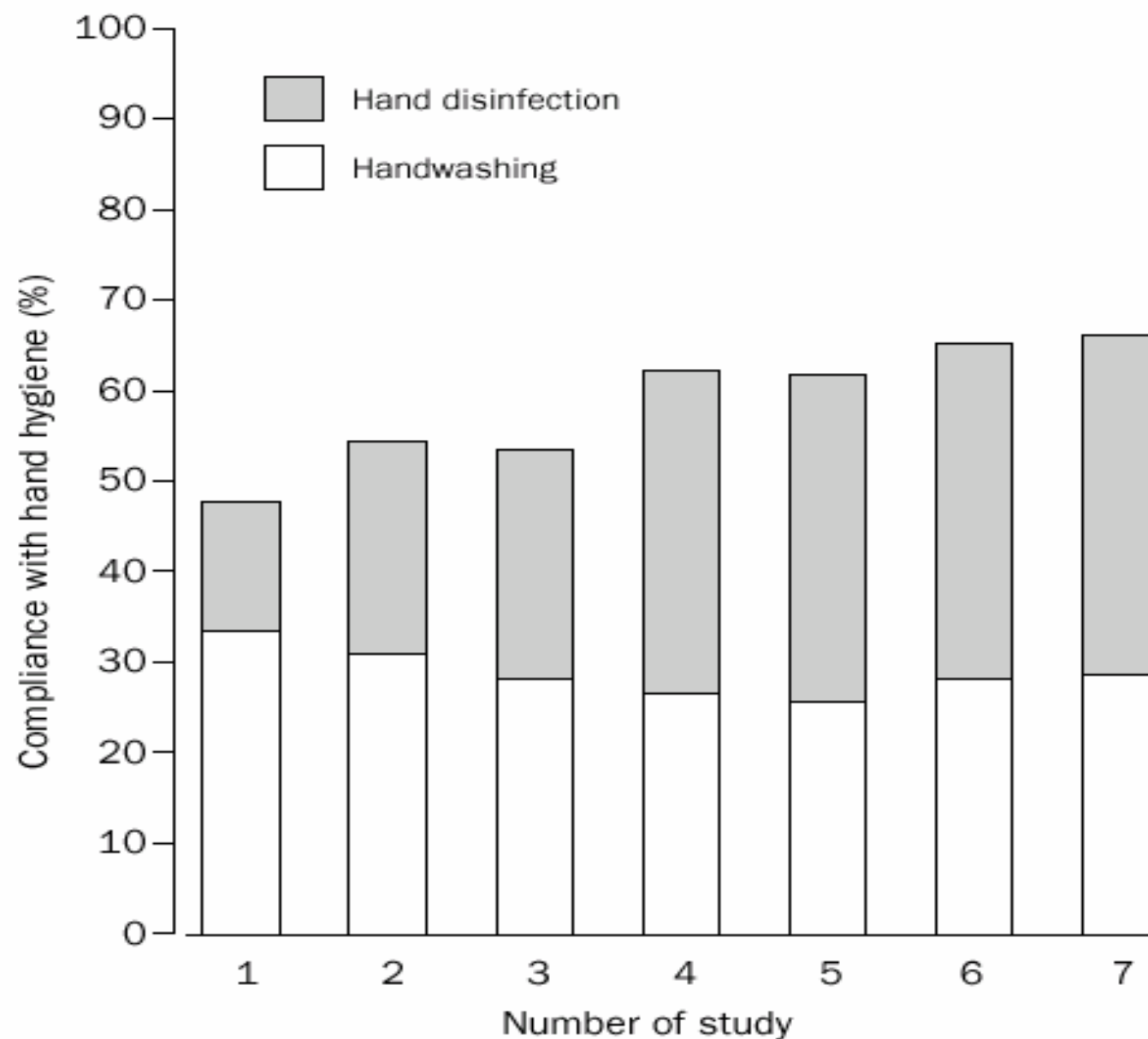
# Preventing acquisition

- Hand decontamination
- Antibiotic use
- Screening and isolation
- Clean hospital?

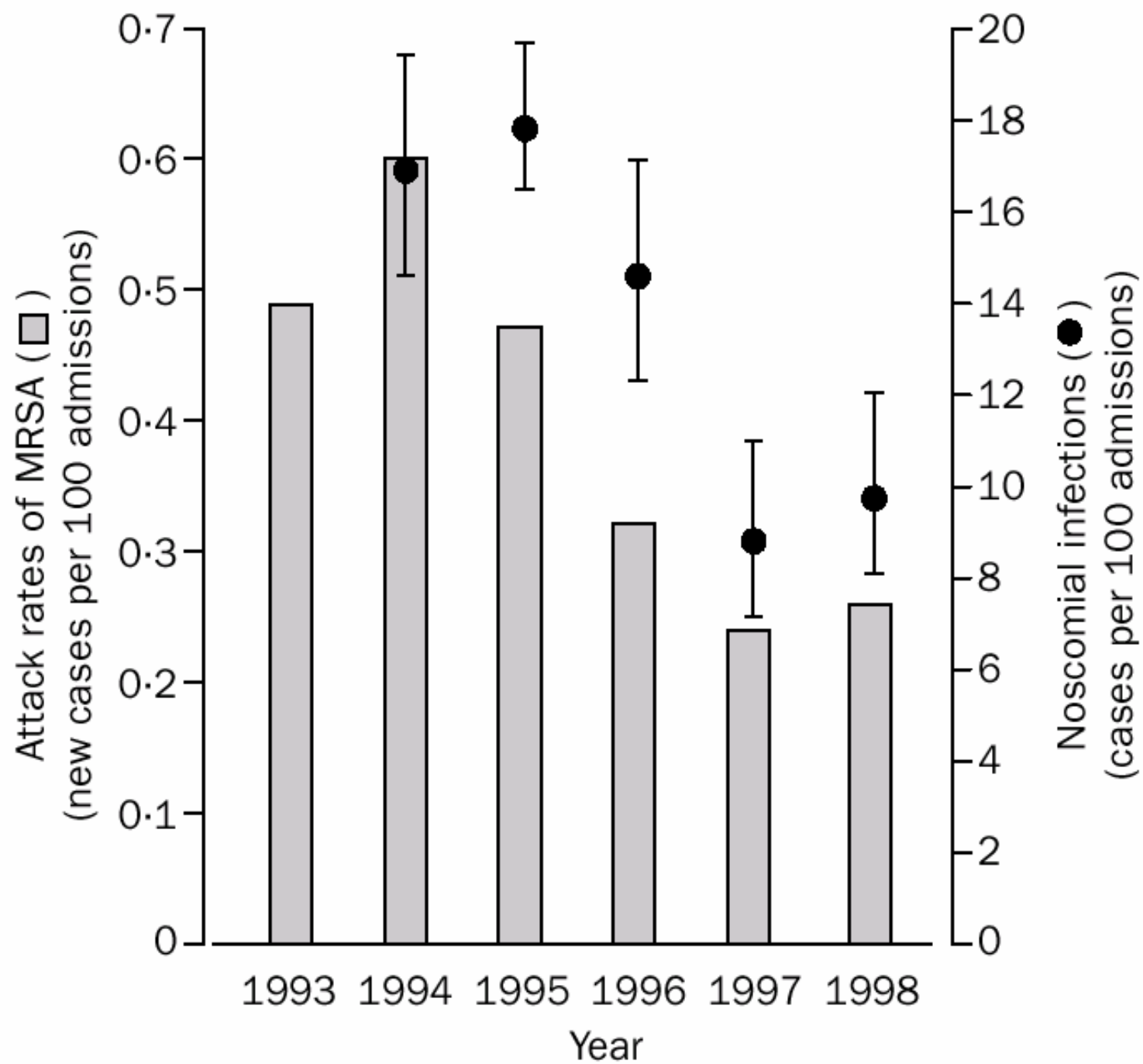








**Figure 1: Hand-hygiene compliance trend during seven consecutive hospital-wide surveys, University of Geneva Hospitals, 1994–97**

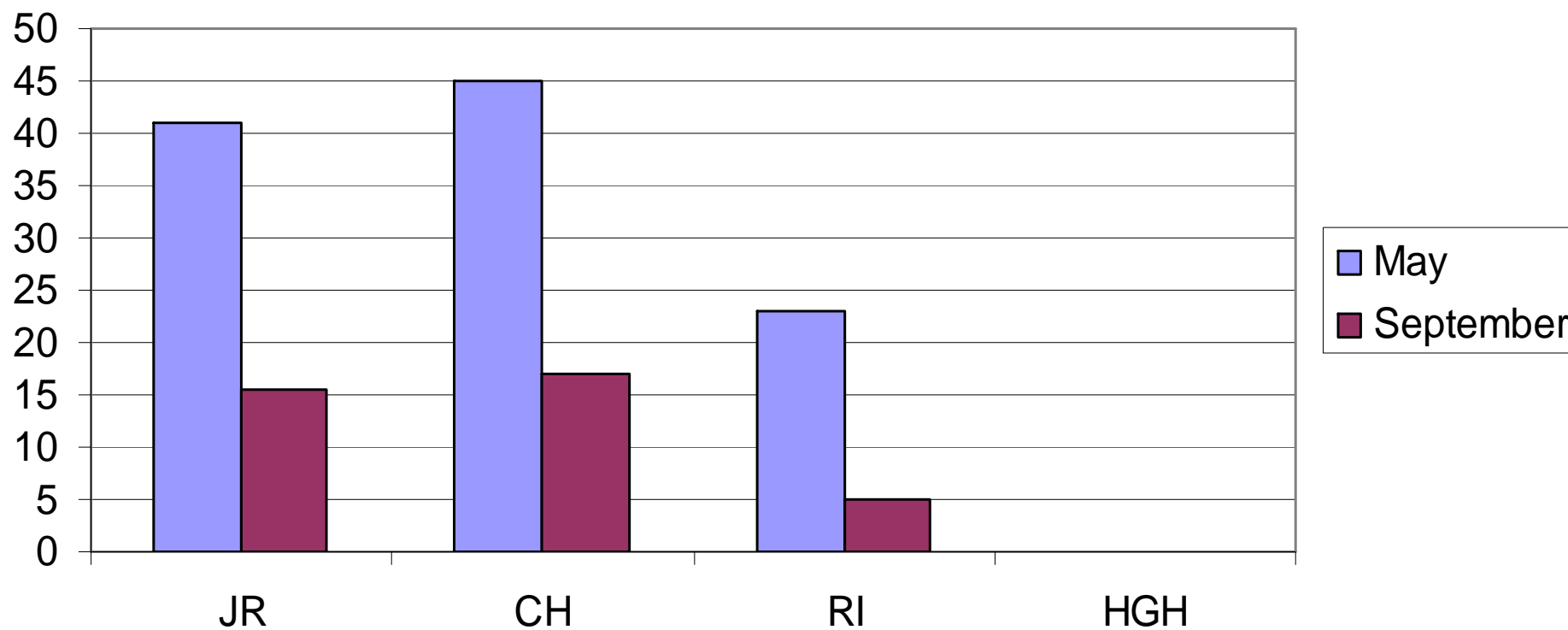




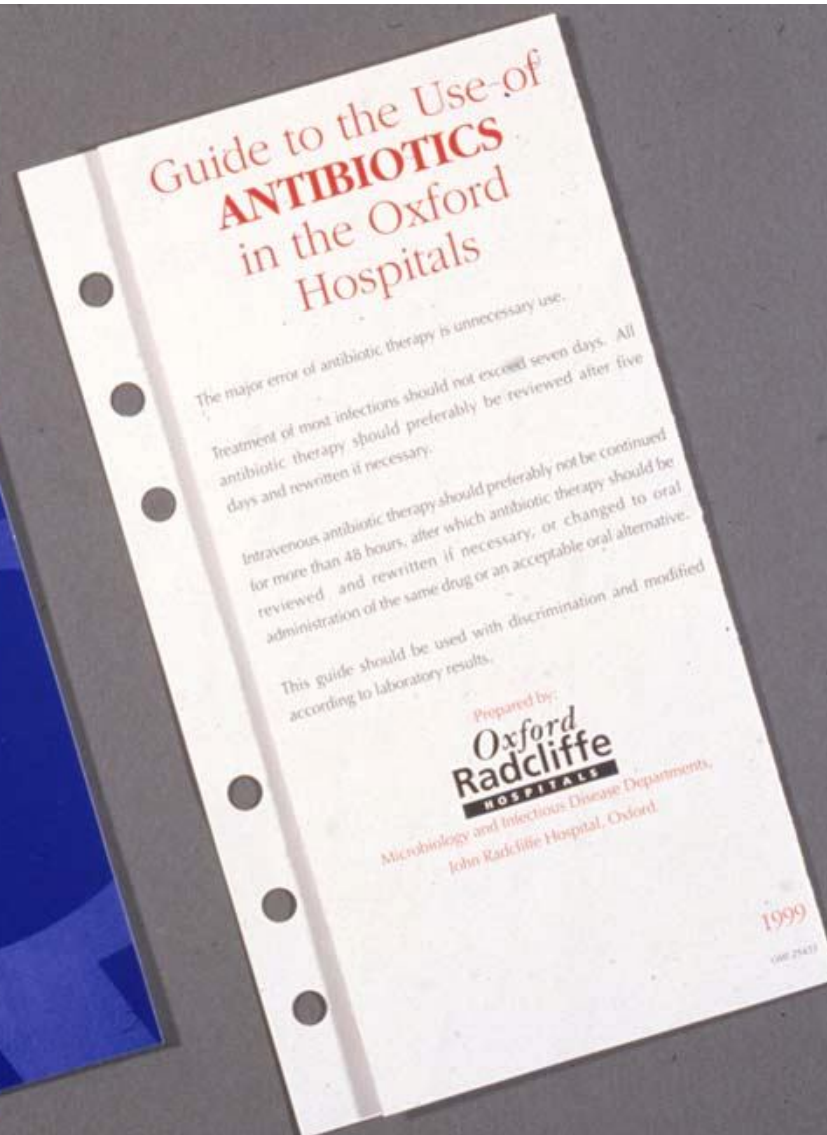
# Handy Hygiene campaign 2001

- Better quality paper towel
  - Saved £ 98,000
- Alcohol rub at every bedside
  - wall dispensers empty
  - new products November 2004
- Staff education
- Patient education

## **% Wall alcohol dispensers empty or broken ORH 2002**







## Guide to the Use of **ANTIBIOTICS** in the Oxford Hospitals

The major error of antibiotic therapy is unnecessary use.

Treatment of most infections should not exceed seven days. All antibiotic therapy should preferably be reviewed after five days and rewritten if necessary.

Intravenous antibiotic therapy should preferably not be continued for more than 48 hours, after which antibiotic therapy should be reviewed and rewritten if necessary, or changed to oral administration of the same drug or an acceptable oral alternative.

This guide should be used with discrimination and modified according to laboratory results.

Prepared by:  
**Oxford Radcliffe**  
HOSPITALS

Microbiology and Infectious Disease Departments,  
John Radcliffe Hospital, Oxford

1999

GMR 25433

# Antibiotic control

- Cefuroxime restriction
- Meropenem audits & restriction
- 80% used as per policy
- Limited impact in high transmission areas



# Antibiotic use

- Treatment guidelines
  - Gentamicin for sick patients
  - Vancomycin if known MRSA
- Prophylaxis
  - Gentamicin for all clean surgery
  - Vancomycin if known MRSA

# Admission screening

- MRSA status
  - therapy
  - prophylaxis
  - single room/barrier nursing

# Isolation of MRSA positive patients

- hand hygiene
- environmental contamination
- expensive
- risks to patient
- useful in high transmission areas

# Admission Screening

- Screening based on risk
  - high risk units - transmission
  - high risk patients - invasion
- 16,000 screens per annum

# Admission screening

- Low risk areas
  - no admission screening
- Medium risk areas
  - screen high risk patients
- High risk areas
  - screen all admissions

# High risk units

- Screen all admissions
  - Adult ITU
  - Trauma
  - Vascular
  - Neuro ITU

# ITU screening project


- Aims
  - to provide data about MRSA activity
    - how many MRSA positive patients are admitted ?
    - how many patients acquire MRSA ?
  - to study to effect of monthly feedback

# Definitions

- All patients are screened for MRSA on admission ( <48 hours )
- Acquisition
  - not known to be positive previously
  - admission screen negative
  - MRSA positive later in stay



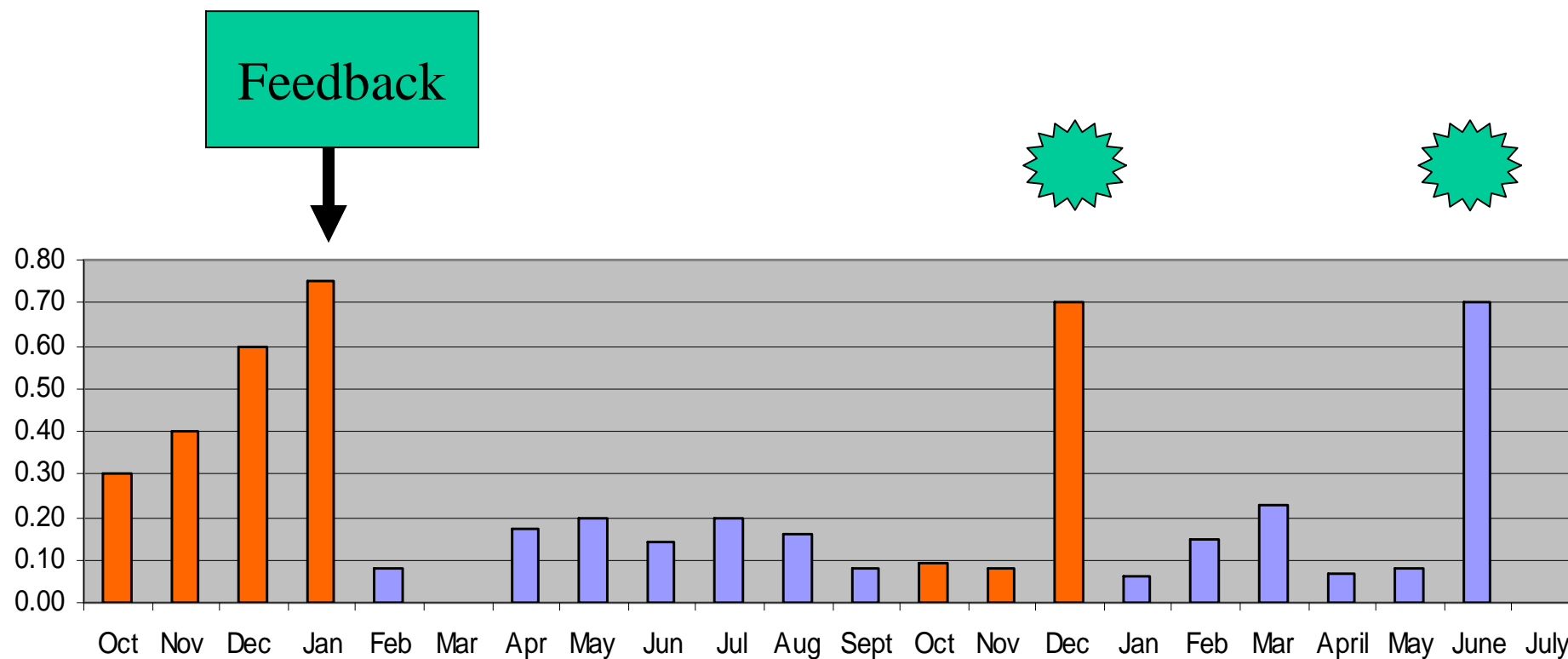
# Results 1

- October 2002  July 2004  
– 22 months
- 1569 admissions
- 1292 screened <48 hours 82%
- 18% not screened

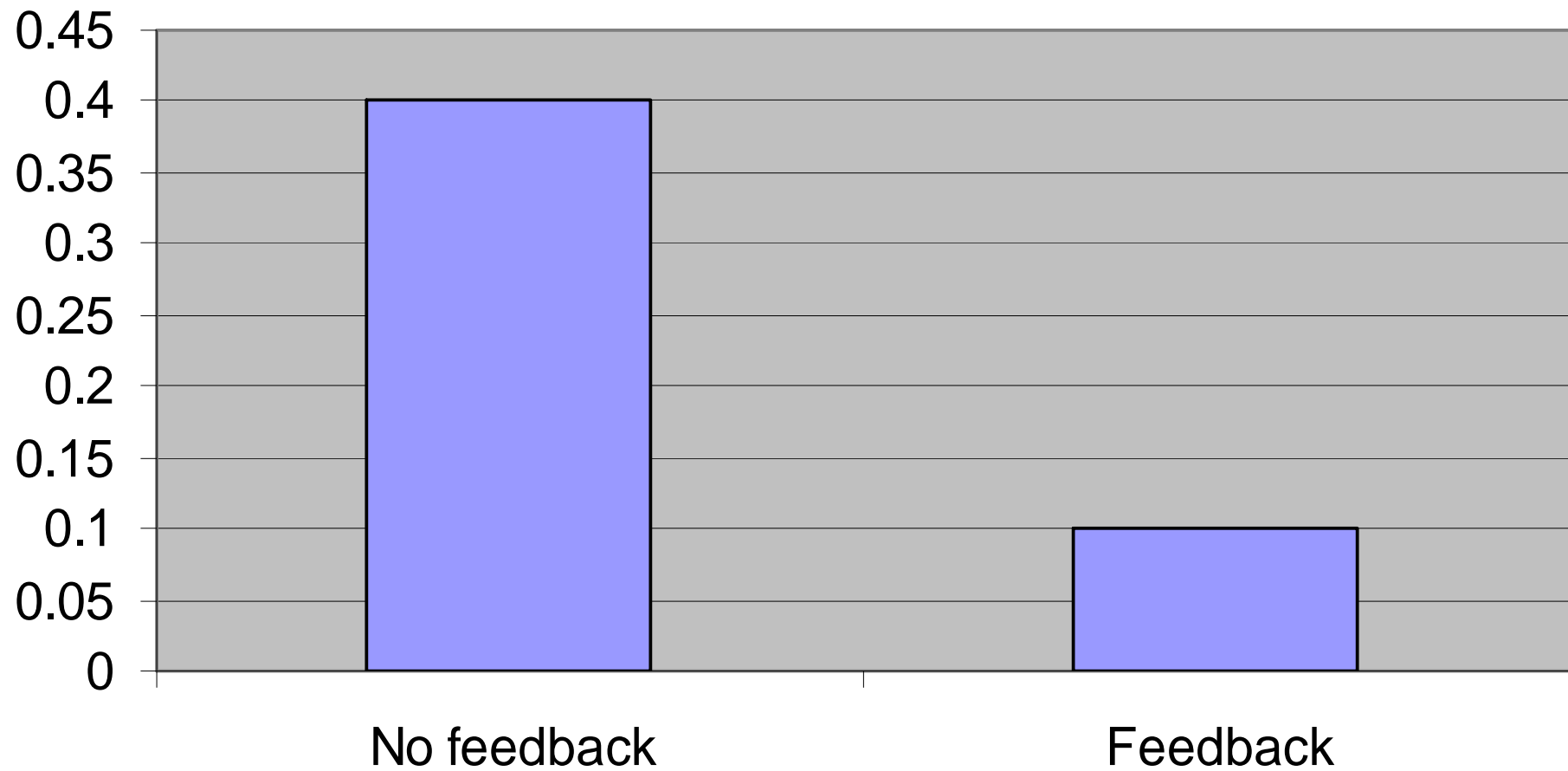
## Results 2

- 18 % admitted carry MRSA
- 3.9 % acquire MRSA
- Transmission varied from month to month

# Ratio of MRSA acquired per MRSA case admitted to AITU



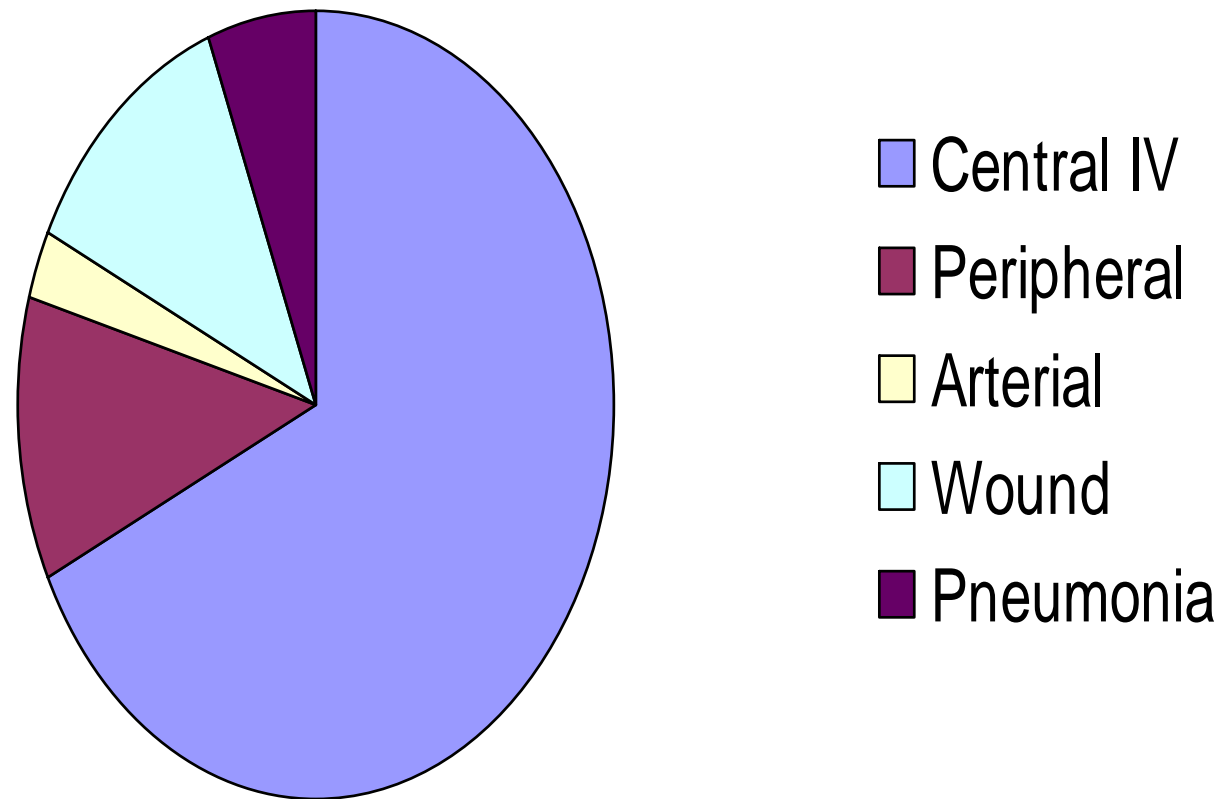
# Average Monthly Transmission Ratio



# Preventing invasion

- Intravascular line care
  - antimicrobial coated central lines
  - phlebitis due to peripheral lines

# 34 Hospital Acquired Staph aureus Bacteraemias May/August 2002



# ITU Central IV policy audit

- June 1997 - May 1998
- Non coated central IV      5 days
- Betadine aqueous skin prep

# ITU Central IV policy audit

- June 1998 - May 1999
- Silver/chlorhexidine central IV 8 days
- Chlorhexidine alcoholic skin prep



# ITU Central IV audit

|             | Non Coated | Silver/Chlorhexidine |
|-------------|------------|----------------------|
| Patients    | 672        | 652                  |
| St aureus + | 33         | 15                   |
| Rate/100pts | 4.9        | 2.4                  |

- 2005 coated lines for all ORH patients?

# IV awareness Level 7 JR

- Peripheral IV devices
- Monthly prevalence surveys
  - Dressing intact
  - Insertion site visible
  - Device in use
  - Phlebitis - VIP score

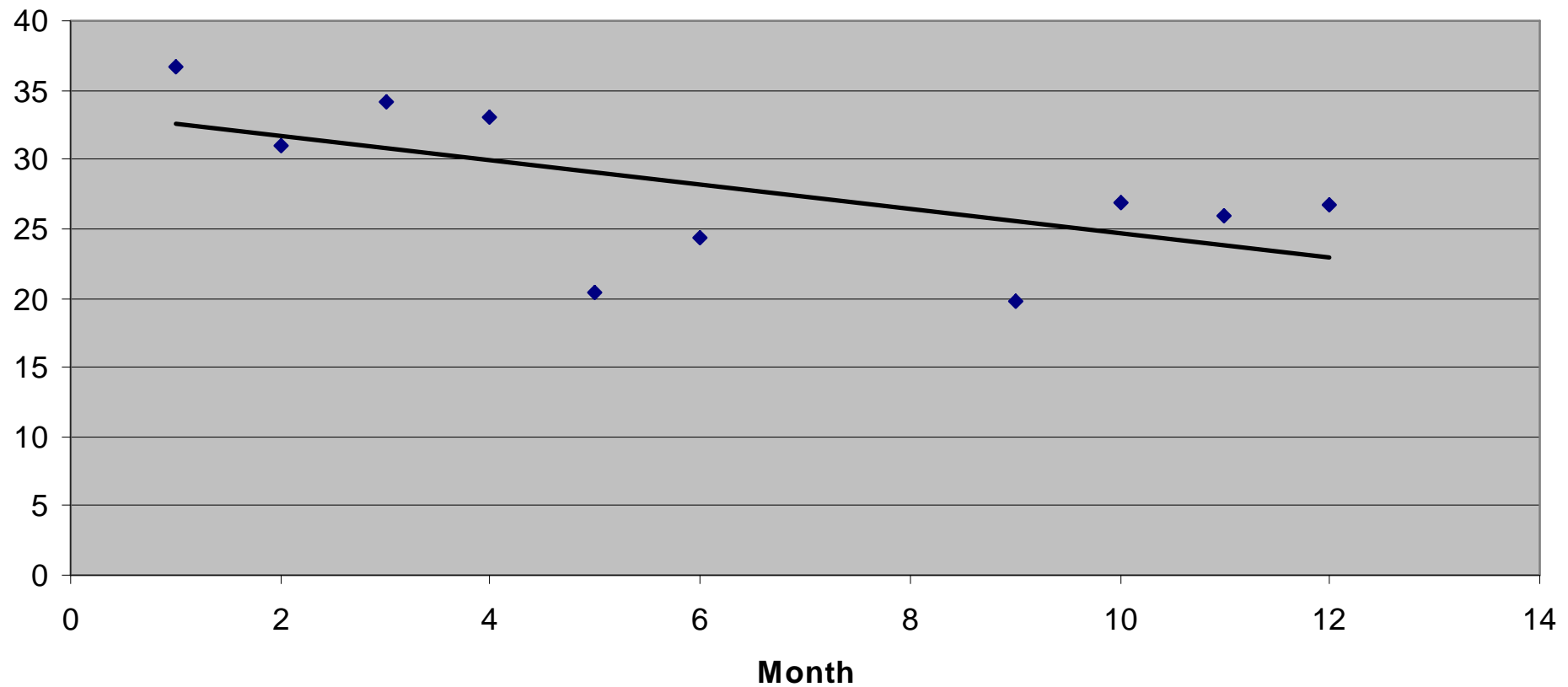
## VISUAL INFUSION PHLEBITIS SCORE

|  |   |   |
|--|---|---|
| IV site appears healthy  | 0 | No signs of phlebitis<br>OBSERVE CANNULA  |
| One of the following is evident:<br>Slight pain near IV site <b>or</b> Slight redness near IV site   | 1 | Possible first signs of phlebitis<br>OBSERVE CANNULA  |
| Two of the following are evident:<br>? Pain at IV site ? Swelling ? Erythema   | 2 | Early stage of phlebitis<br>RESITE CANNULA  |
| <b>ALL</b> of the following signs are evident:<br>? Pain along cannula ? Erythema ? Swelling   | 3 | Medium stage of phlebitis<br>RESITE CANNULA<br>CONSIDER TREATMENT                                   |
| <b>ALL</b> of the following signs are evident and extensive:<br>? Pain along the path of the cannula ? Erythema<br>? Swelling ? Palpable venous cord           | 4 | Advanced stage of phlebitis or start of<br>thrombophlebitis<br>RESITE CANNULA<br>CONSIDER TREATMENT |
| <b>ALL</b> of the following signs are evident and extensive:<br>? Pain along the path of the cannula ? Erythema ?<br>Swelling ? Palpable venous cord ? Pyrexia | 5 | Advanced stage of thrombophlebitis<br>RESITE CANNULA<br>INITIATE TREATMENT                          |

# Level 7 JRH 2000

## Feedback of IV audit data

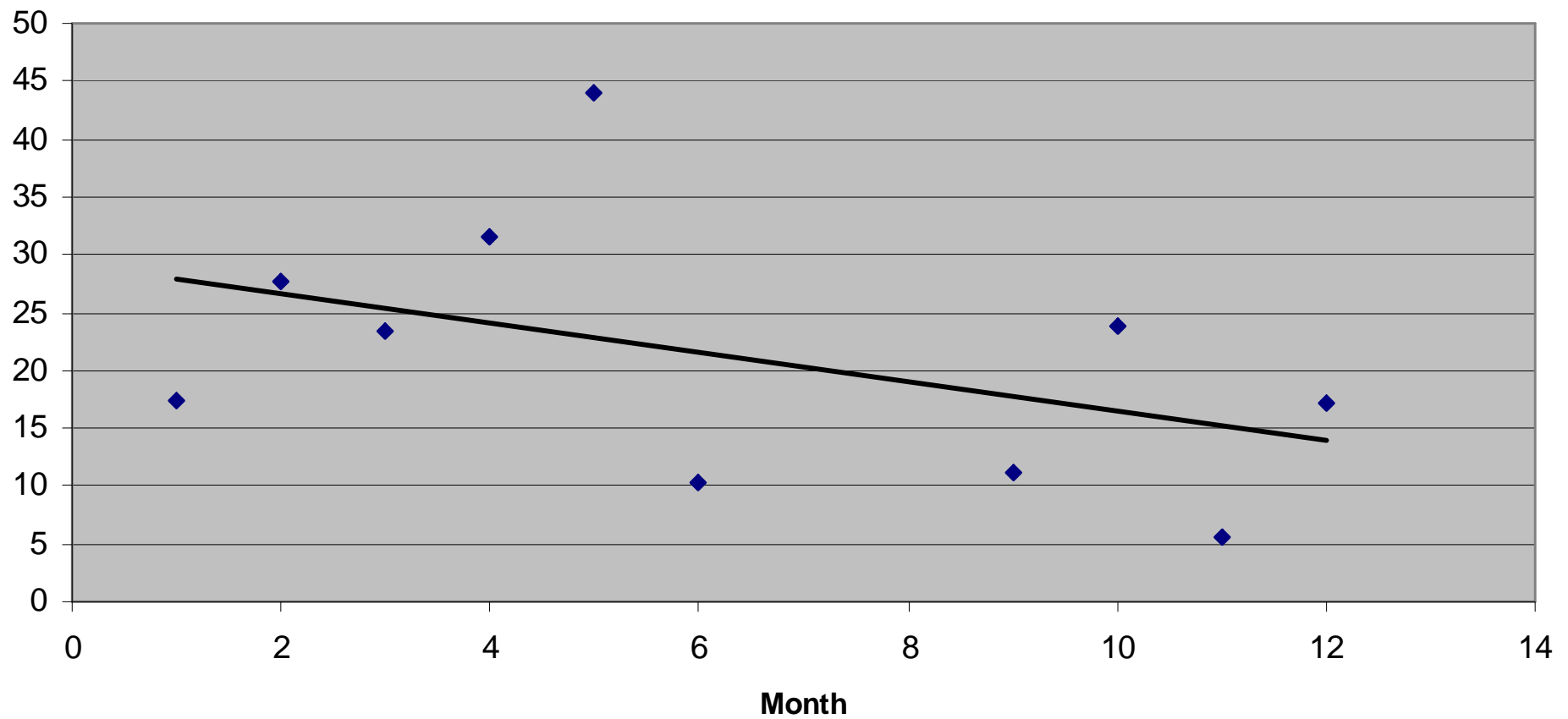
**Figure 1: % Patients with cannula**



# Level 7 JRH 2000

## Feedback of IV audit data

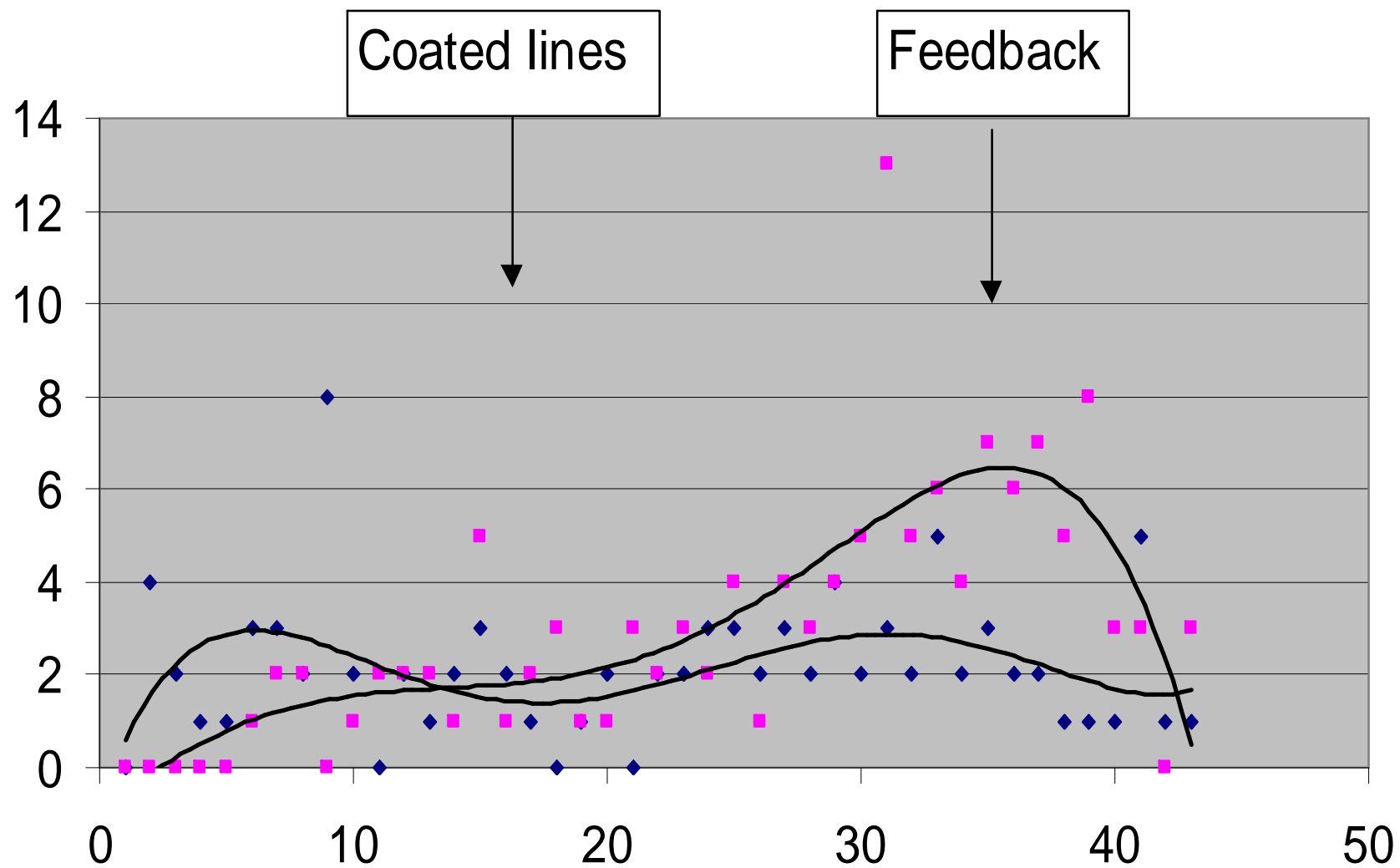
**Figure 2 % Cannulae Not in Use**



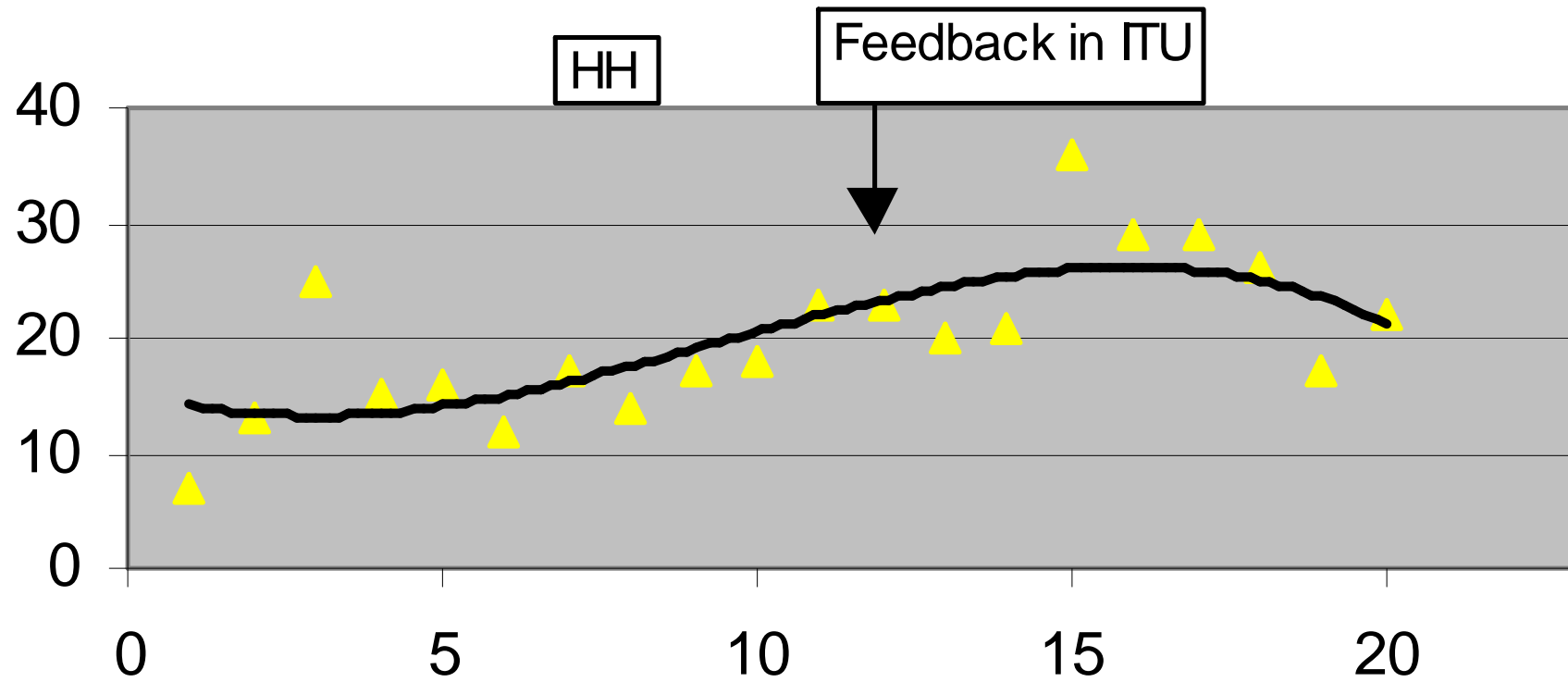
## IV Awareness Weeks 2002/3

- 43 clinical areas
  - 771 patients audited
    - 43% had a peripheral IV
    - 92% intact dressing
    - 87% entry site easy to view
    - 24% not in use for last 24 hours
  - 3% had VIP score of 2 or more (phlebitis)
- 10 patients at risk of Staph aureus bacteraemia

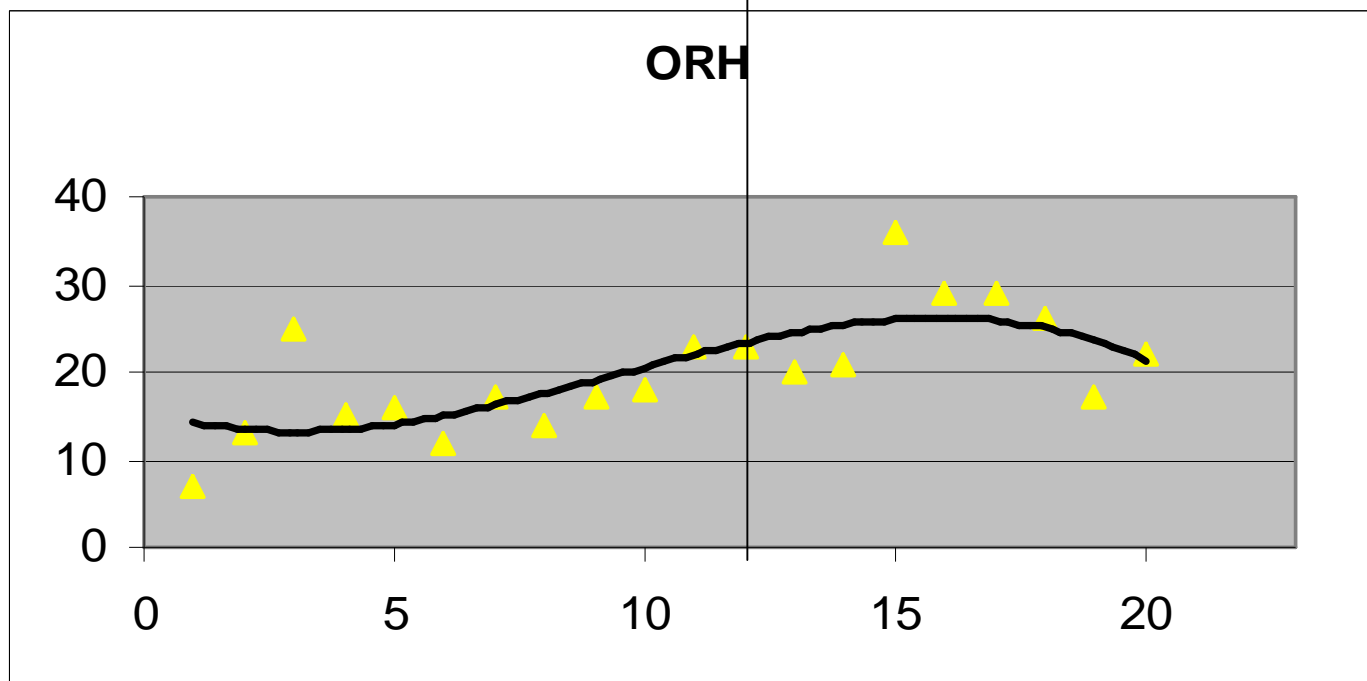
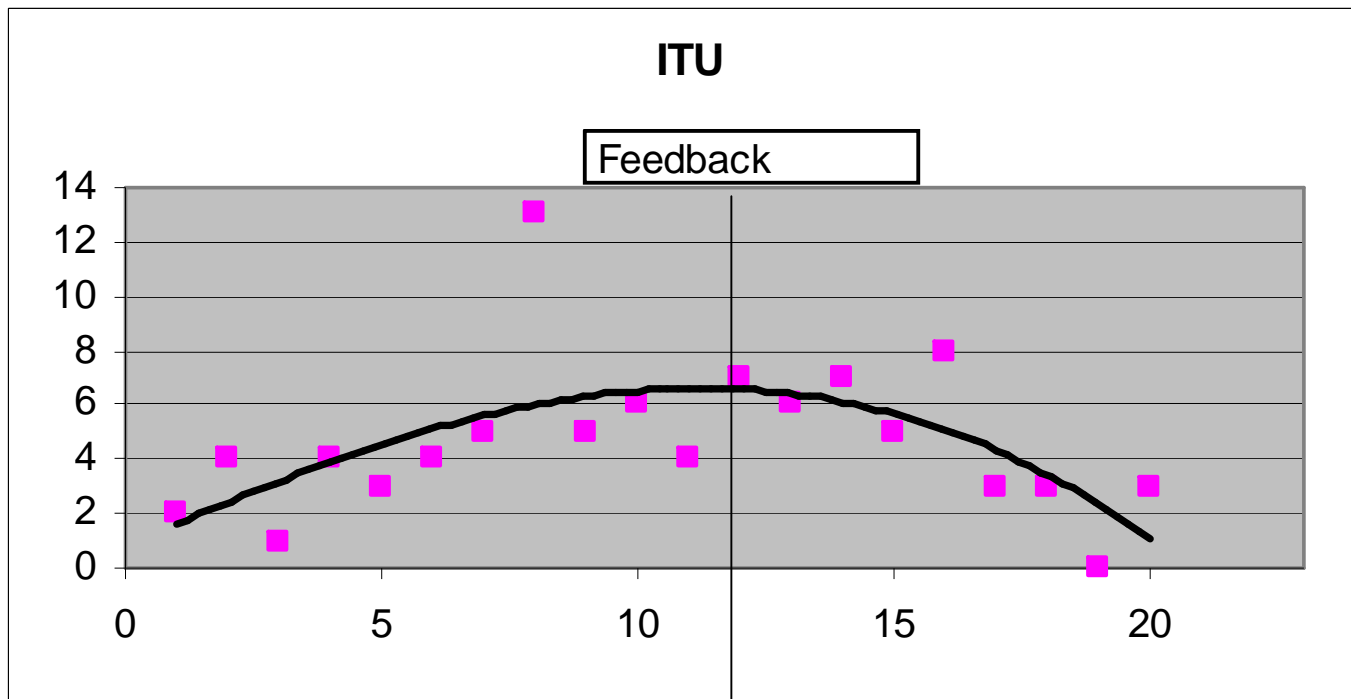
# ITU MRSA and MSSA bacteraemia 1994 -2004



# ORH MRSA bacteraemia 2000-4







# Targets are good

- Clinicians provide expertise
- Managers are performance managed
- Organisation responds